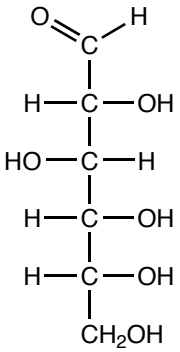
Name _____ Test 2
PHYS 0213 (Biochem) Spring 2005

1. (5 pts.) When glucose's C_1 is oxidized D-glucoaldonic acid forms.
   a. Draw a Fischer projection of D-glucoaldonic acid. (D-glucose is drawn below.)



   b. (5 pts.) Draw a Haworth projection of the six membered ring form of D-glucoaldonic acid.

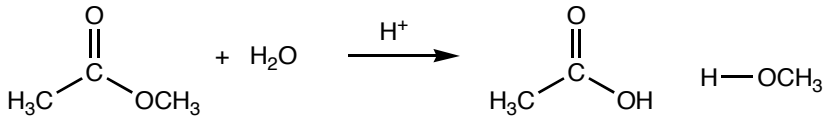
2. (8 pts.) Draw a Fischer projection for D-fructose.

3. a. (3 pts.) How many elements are in a pyranose ring?

   b. (3 pts.) How many carbon atoms and oxygen atoms are in a furanose ring?

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____

4. (8 pts.) Draw the mechanism for the general acid catalyzed hydrolysis of an ester. In other words, draw the mechanism for the following reaction.



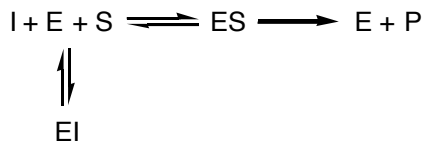
5. The Michaelis-Menten equation is written below.

$$\text{rate} = V_{max}\frac{[S]}{K_m + [S]}$$

a. (6 pts) Does the Michaelis-Menten model predict that the rate of the reaction is first order with respect to [S] or zero order with respect to [S] at high substrate concentration? Remember to explain your response.

b. (6 pts) Explain how the equation accounts for the observation that at low substrate concentrations, the reaction is first order with respect to the substrate concentration. When responding, consider the size of K_m.

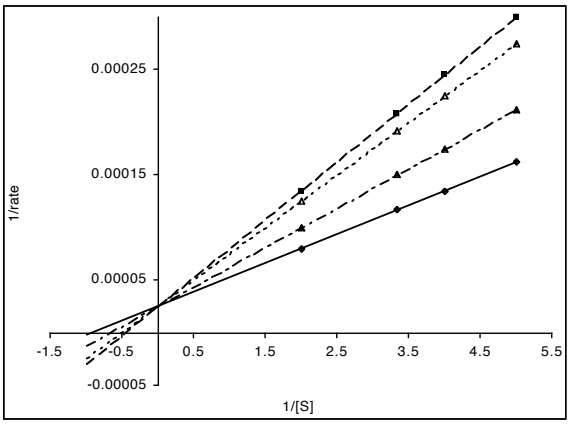
6. The mechanism by which a competitive inhibition occurs is explained by the following equation.

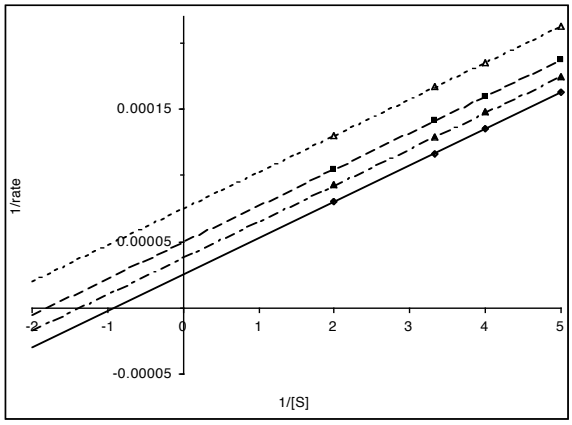


a. (4 pts) Why is this model of enzyme inhibition referred to as competitive inhibition?

b. (4 pts.) With competitive inhibition, V_{max} can still be attained. Explain how V_{max} can be reached even though inhibitor is present.

7. The graphs below show the rate of an enzyme catalyzed reaction under increasing inhibitor concentration.



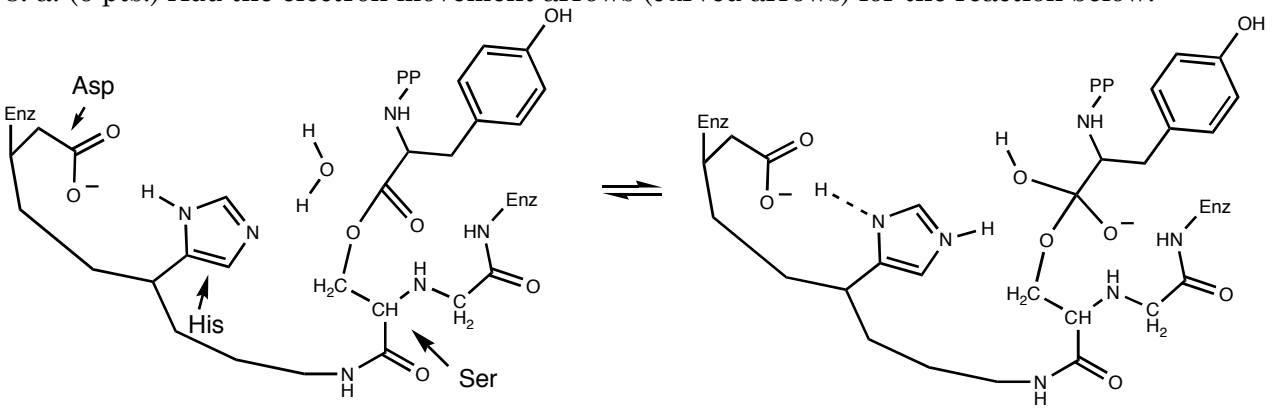


a. (2 pts.) For both graphs, which line represents the uninhibited reaction (label the line)?

b. (2 pts.) For both graphs, which line represents the experiment with the highest concentration of inhibitor (label the line)?

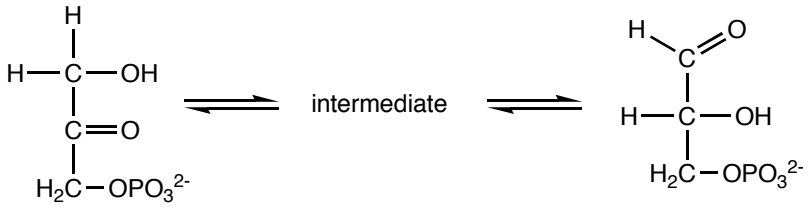
c. (4 pts.) The graph on the left is consistent with competitive inhibition. What can we learn about V_{max} from the graph on the left?

8. a. (6 pts.) Add the electron movement arrows (curved arrows) for the reaction below.

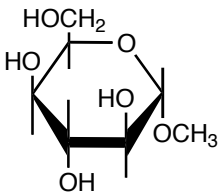


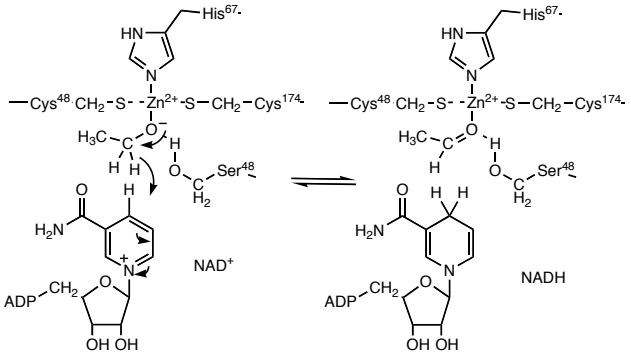
b. (6 pts.) What are the roles of the histidine and aspartate residues.

9. (8 pts.) Isomerization of sugars often occurs through an enediol intermediate. Dihydroxyacetonephosphate and glyceraldehyde-3-phosphate are shown below. Draw the enediol intermediate.



10. (6 pts.) Identify the nucleophilic site(s) on the following sugar.



11. 

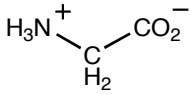
a. (4 pts) The role of the NAD^+ is what?

b. (2 pts.) The NAD^+ is a co_____ .

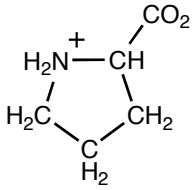
c. (2 pts) The Zn^{2+} is a co_____ .

d. Is the ethanol (ethoxide) being oxidized or reduced?

12. a. (8 pts.) The amino acids glycine and proline, drawn below, often appear at the end of the secondary structures drawn in question 13. Explain why these amino acids might interrupt the regularly repeating pattern of H-bonding that results in the formation of the aforementioned secondary structures.

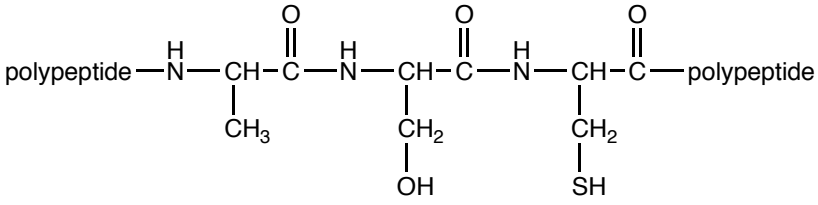


glycine

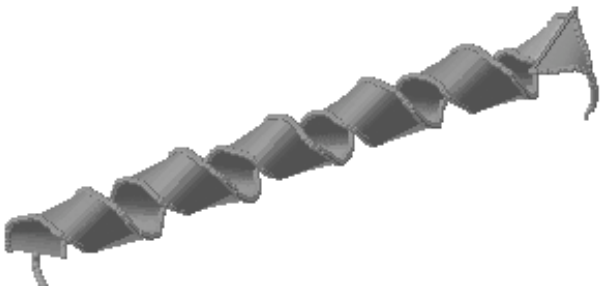


proline

b. (6 pts.) A sequence of three amino acids in the middle of a polypeptide are drawn below. Identify (cicle and lable) the H-bond donors and H-bond acceptors that are primarily responsible for forming the secondary structures pictured in question 13.

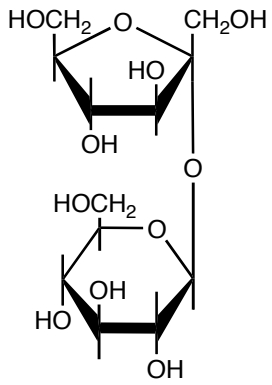


13. (4 pts. each) Identify the following secondary structures.



a. _____ b. _____

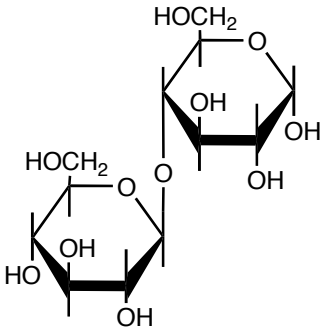
14. For each of the disaccharides drawn below answer the following questions.



a. (3 pts) Identify the anomeric carbon(s).

b. (3 pts) Indicate whether the anomeric carbon(s) has α or β stereochemistry.

c. (3 pts) Indicate whether the anomeric carbon is an acetal or a hemiacetal.



d. (3 pts.) Identify any anomeric carbon that can freely change its geometry.